



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|----------------------|------------------|
| 10/046,918 | 01/17/2002 | Itaru Shibata | 50195-289 | 3374 |
| 20277 | 7590 | 08/20/2004 | EXAMINER | |
| MCDERMOTT WILL & EMERY LLP 600 13TH STREET, N.W. WASHINGTON, DC 20005-3096 | | | TSANG FOSTER, SUSY N | |
| | | ART UNIT | PAPER NUMBER | |
| | | 1745 | | |

DATE MAILED: 08/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|------------------------------|---------------------|----------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 10/046,918 | SHIBATA ET AL. |
| | Examiner | Art Unit |
| | Susy N Tsang-Foster | 1745 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 17 May 2004.
- 2a) This action is **FINAL**. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-4,6-9 and 11-35 is/are pending in the application.
- 4a) Of the above claim(s) 2,16-26,28,30 and 32-35 is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1,4,7-9,11,27,29 and 31 is/are rejected.
- 7) Claim(s) 3,6 and 12-15 is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 17 May 2004 is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office Action is responsive to the amendment filed on 5/17/2004. Claims 1, 7, and 27 are amended. Claims 5 and 10 are cancelled. Claims 1-4, 6-9, and 11-35 are pending. The art rejections in the previous office action are withdrawn in view of applicant's amendment to claim 1. Claims 2, 16-26, 28, 30, and 32-35 are withdrawn from consideration as being drawn to a non-elected invention or species. Claims 3, 6, and 12-15 are objected to for reasons below. Claims 1, 4, 7-9, 11, 27, 29, and 31 are finally rejected for reasons necessitated by applicant's amendment.

Drawings

2. The drawings were received on 5/17/2004. These drawings are approved by the Examiner.

Specification

3. The disclosure is objected to because of the following informalities:

On page 3, line 23, "air" should be "fuel" in order to maintain consistency in the specification.

The full terminology for the abbreviation PVD is not given anywhere in the specification or claims. For the purposes of prosecution, the Examiner is interpreting this abbreviation to mean physical vapor deposition in the specification and claims as currently understood by one of ordinary skill in the art.

Appropriate correction is required.

Claim Objections

4. Claim 6 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. In claim 6, the limitation that the thickness (tc1) of the adhering cathode layer is equal to 1 micron or less and the thickness (tc2) of the electricity collecting cathode layer is equal to 10 microns or more does not appear to further limit claim 1 which requires that the ratio of tc1/tc2 to range from 1/1000 to 1/500 which would not be satisfied if tc1 were to equal 1 micron and tc2 were to equal 10 microns.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 4, 9, and 11 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Borglum et al. (US Pat. No. 6,139,985).

The product-by-process limitations in claim 1 are not given patentable weight since the courts have held that patentability is based on a product itself, even if the prior art product is made by a different process (see In re Thorpe, 227 USPQ 964, (CAFC 1985), In re Brown, 173 USPQ 685 (CCPA 1972), and In re Marosi, 218 USPQ 289, 292-293 (CAFC 1983)). In claim 1, the process limitation “is formed by using a PVD method” and the process limitation “is formed by using one of a printing method and a spray coating method” are not given patentable weight in a product claim.

Borglum et al. disclose an electrochemical cell comprising a unit cell that comprises a porous fuel electrode and a porous air electrode, with solid oxide electrolyte therebetween and characterized in that the air electrode surface opposing the electrolyte has a separate, attached, dense continuous layer of a material comprising cerium oxide, and where the electrolyte contacts the continuous cerium oxide layer without contacting the air electrode (col. 2, lines 45-52).

The continuous layer of cerium oxide is in solid film form from approximately 0.001 micron to 5 microns thick and is essentially continuous and integral with the electrolyte layer and tightly bonded to the electrode (col. 3, lines 5-11). The preferred electrochemical cell is a tubular fuel cell (col. 3, lines 10-11). The reference also discloses that the invention of the reference is also applicable to flat plate and other fuel cell configurations (col. 3, lines 22-26).

The air electrode is made of doped lanthanum manganite having a thickness of 1500 microns to 3000 microns thick and sintered particle diameters from about 1 micron to about 15 microns (col. 4, lines 12-18).

As seen in Figure 3 of the reference, the cerium oxide interlayer 14 is a continuous layer and the term "continuous" as used in the reference means over the exterior portions of the air electrode particles 24 to form a essentially complete barrier between the air electrode particles and the electrolyte 15 (col. 4, lines 53-57). There are also pore entrances 33 as seen in Figure 3 and in this sense, the interlayer can be said to be a discontinuous thin film layer along the surface of the electrolyte. The cerium oxide can be doped or undoped and a minor amount of rare earth dopant may be used to increase the ionic and/or electronic conductivity of the CeO₂ (col. 4, lines 60-65).

The interlayer is deposited by vapor deposition such as CVD/EVD (col. 4, lines 65-67 and col. 5, lines 1-5). The thickness of the CeO₂ interface film can range from about 0.001 microns to about 5 microns (col. 5, lines 57-60). When the layer of CeO₂ is about 5 microns thick and the layer of air electrode is about 3000 microns thick, the ratio of the thickness of the CeO₂ layer to that of the air electrode is 0.0017 which is between 1/1000 and 1/500. The average diameter of the constituent particles of the air electrode and the particles of the interlayer would

be dominated by the diameter of the constituent particles of the air electrode since the air electrode is about 600 times thicker than the interlayer. The air electrode has sintered particle diameters from about 1 micron to about 15 microns (col. 4, lines 12-18). The average diameter of the particles would range from 1 micron to about 15 microns. When the average diameter of the particles is 15 microns, the relationship $0.01 \text{ dc} \leq tc1 \leq 0.5 \text{ dc}$ would be satisfied since $tc1$ can be 5 microns which falls within the claimed range of the relationship.

9. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Borglum et al. (US Pat. No. 6,139,985) in view of Schroeder et al. (US Pat. No. 4,957,673).

Borglum et al. disclose all the limitations of claim 7 except that the air electrode layer has porosity of 30 to 70%.

Schroeder et al. teach that a strontium doped lanthanum manganite (LSM) electrode in a solid oxide fuel cell should have a porosity of 40 to 50% so that gases will be readily transported through the LSM electrode layer to the electrolyte layer (col. 9, lines 25-35).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the lanthanum manganite layer of the air electrode of Borglum et al. to have a porosity of 40 to 50% so that gases such as air would be readily transported through the air electrode to the electrolyte layer for the electrochemical reaction to occur to generate electricity.

10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Borglum et al. (US Pat. No. 6,139,985) in view of Badding et al. (USPGPUB 2001/0044041).

Borglum et al. disclose all the limitations of claim 8 except that the cathode (the electricity collecting cathode layer) is coated on the interfacial layer (adhering cathode layer) in approximately in a net fashion.

Badding et al. teach that the geometry of electrodes can be chosen to make for better use of fuel or fuel delivery and can be any shape to allow for manifolding and improved performance (see paragraph 69).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the cathode approximately in a net fashion on the interfacial layer because the geometry of the electrode can be chosen to make for better use of fuel or fuel delivery and can be any shape to allow for manifolding and improved performance.

Thus, Badding et al. is clearly teaching that the electrode geometry results effective variable. The courts have held that optimization of a results effective variable is not novel. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

11. Claims 27, 29, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borglum et al. (US Pat. No. 6,139,985) in view of Nishioka et al. (US Pat. No. 5,543,241).

Borglum et al. disclose all the limitations of claims 27, 29 and 31 except that unit cells are arranged two-dimensional to form a cell plate and layering the cell plates, or layering the single cells.

Nishioka et al. disclose that units cell of a solid oxide fuel can be arranged two-dimensionally to form a cell plate and layering the cell plates three-dimensionally to yield a high voltage fuel cell (col. 10, lines 5-32).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to arrange the units cells of the solid oxide fuel cell of Borglum et al. two dimensionally to form cell plates and stacking the cell plates three-dimensionally to yield a high voltage fuel cell. In this three-dimensional arrangement, the single cells are also layered.

Allowable Subject Matter

12. Claims 3, and 12-15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

13. The following is a statement of reasons for the indication of allowable subject matter:

The closest prior art of record, Borglum et al. do not disclose, teach, or suggest any of the following distinguishing features:

- a) that the interlayer comprises a conductive particle material having a particle diameter of 0.5 microns or less and the air electrode comprises a conductive particle material having a particle diameter of 0.8 microns or more (applies to claim 3);
- b) that the interlayer is formed of silver or essentially contains silver (applies to claims 12 and 13); and
- c) that the interlayer is formed of bismuth oxide or essentially contains bismuth oxide (applies to claims 14 and 15).

Response to Arguments

14. Applicant's arguments with respect to claims 1, 4, 7-9, 11, 27, 29, and 31 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications should be directed to examiner Susy Tsang-Foster, Ph.D. whose telephone number is (571) 272-1293. The examiner can normally be reached on Monday through Friday from 9:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at (571) 272-1292.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

st/ *Susy Tsang-Foster*

Susy Tsang-Foster
Primary Examiner
Art Unit 1745